Standard for Riparian Forest Buffer

Definition

An area of trees and shrubs 35 – 300 feet wide located up gradient, adjacent, and parallel to the edge of a water feature.

Purpose

- reduce excess amounts of sediment, organic matter, nutrients, and other pollutants in sheet – flow surface runoff, and reduce soluble pollutants in shallow ground water flow
- Create shade along water bodies to lower aquatic temperatures
- Provide a source of detritus and large woody debris for fish and other aquatic organisms
- Provide riparian habitat and corridors for wildlife
- Increase infiltration and recharge to groundwater
- Reduce erosion of streambanks and shorelines

Conditions Where Practice Applies

On stable areas adjacent to permanent or intermittent streams, lakes, ponds, wetlands, wellheads, and areas of particularly critical ground water recharge. *Runoff must enter the buffer in sheet flow, not as end-of-pipe concentrated flow.*
Riparian forest buffers can be in place as:

- naturally occurring, where protection and enhancement is critical;
- newly established as part of a new development BMP system;
- retrofitted to an existing development.

Design Criteria

1. General Criteria: Zones and Widths (Figures 1-3)

The riparian forest buffer consists of three zones: streamside, managed, and grass filter. Zone 1 is the *streamside* zone. It begins at the edge of the active channel or shore, and extend a minimum distance of 15 feet , measured horizontally on a line perpendicular to the water course or water body. The *managed* zone (zone 2) begins at the edge of the streamside zone, and extends a minimum of 20 feet horizontally and perpendicular. Zone 3, the grass *filter strip*, which is an optional component of the buffer, begins at the edge of the managed zone and extends a minimum of 20 feet horizontally and perpendicular.
The minimum combined width of zones 1 and 2 will be either:

- 100 feet or 30% of the geomorphic flood plain, whichever is less
- 35 feet for an incised channel with no floodplain

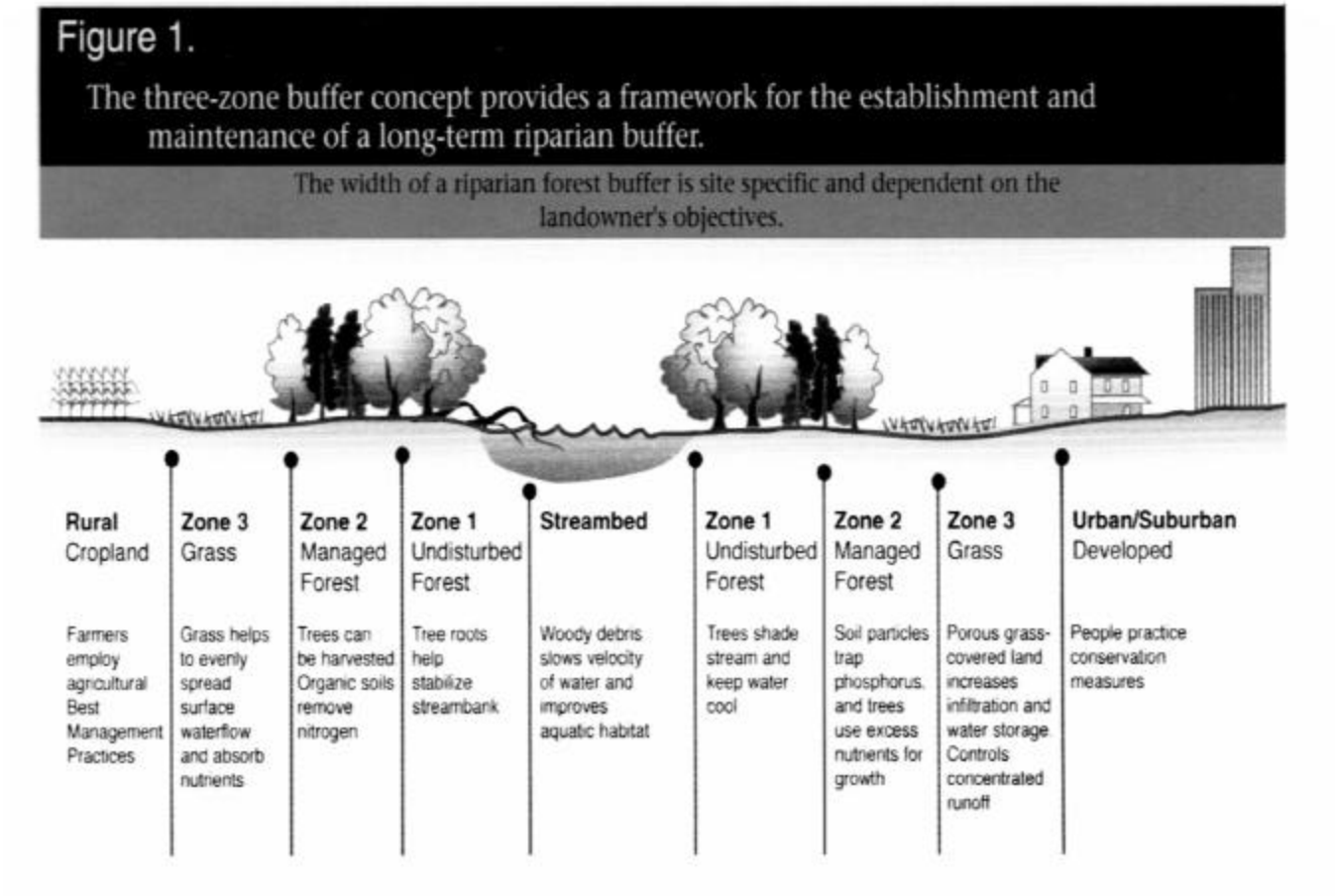

Figure 1. Purposes of the Zones Source: Maryland Cooperative Extension

Zone 1 and 2 dominant vegetation will consist of existing or planted trees and shrubs suited to the site and the intended purpose. Selection of locally native species will be a priority when feasible. Plantings will consist of three or more species suitable to the seasonal variation of soil moisture status of the buffer site, compatible growth rates, shade tolerance and wildlife value.

No tree removal shall be performed in zone 1 to preserve the integrity and natural functions of the streamside area. Limited tree, fruit, and nut harvesting may be done in zone 2 provided that the buffer's water quality characteristics are not compromised by loss of vegetation and soil disturbance by harvesting.

Concentrated flow erosion, excessive sheet and rill erosion, or mass soil movement shall be controlled in the up gradient area immediately adjacent to zone 2 prior to establishment of the riparian forest buffer.

2. Criteria for Establishing the Riparian Buffer

Necessary site preparation and planting for establishing new buffers shall be done at a time and manner to ensure survival and growth of selected species.

Surface Preparation: Soil may be tilled in narrow strips to a 12" depth for the rows of trees and shrubs. Stay at least 5 feet away from the stream bank. Any plantings done closer to the streambank shall be done using soil bioengineering techniques.
The area should be graded to ensure that runoff entering the buffer will come in with sheet flow, not concentrated flow. This may entail use of a level spreader of earth or gravel.

Infiltration: Infiltration of incoming runoff into the buffer can be enhanced through use of an infiltration trench and berm. The design criteria for the infiltration trench BMP may be followed as is, or may be reduced in all dimensions by up to 25%.

Soil Fertility: A soil fertility assessment requires soil sampling and evaluation of pH with recommended soil amenities. Urban soil may need to be modified because of high pH, compaction, or other constraints.

Weed Control: Noxious, competitive weeds must be controlled to allow newly planted trees and shrubs to become established. Mechanical control, mowing, or applying herbicides are effective methods. Care must be taken to prevent a soil erosion problem when using mechanical methods by employing proper sedimentation controls. Herbicides should be contact, non-carryover type and used sparingly, according to label directions, and by a licensed applicator. **No herbicides shall be applied within zone 1.**

Watering: Provisions should be made ahead of time for watering newly planted trees and shrubs. Watering may be necessary for the first year to ensure establishment.

Planting Stock: Only high quality and locally adapted tree and shrub stock will be used. Refer to **Appendix: Landscaping Guidance for BMPs Plant List, or USDA-NRCS Field Office Technical Guide Standard 391** for recommended species, and **Specifications** for planting procedure.

Planting Density: Initial planting densities will be based on their potential height at age 20 years.

Shrubs less than 10'	
20 year height	3 – 6 feet apart
Shrubs and trees 10' – 25'	
20 year height	5 – 8 feet apart
Trees greater than	
20 year height	8 – 12 feet apart

Streambank and Shoreline Stabilization: Streambank and shoreline erosion problems shall be addressed as needed using accepted bioengineering technology. Consult USDA-NRCS for latest recommendations for live fascines, brush mattressing, wattling, live staking, and other methods.

Animal Control: Possibly the biggest hurdle to overcome in riparian buffer establishment is deer and small rodent damage. Deer browse the tender green growth, and rodents like mice gnaw the bark at the soil surface, girdling the tree. Entire newly planted buffers can be destroyed in this way if protection is not employed.

There are a number of methods to reduce this problem. Plastic tree shelters, tree mats, tree wrap, deer repellent, and fencing all are effective to varying degrees. It is important to figure ahead of time for the labor and expense involved with tree protection.

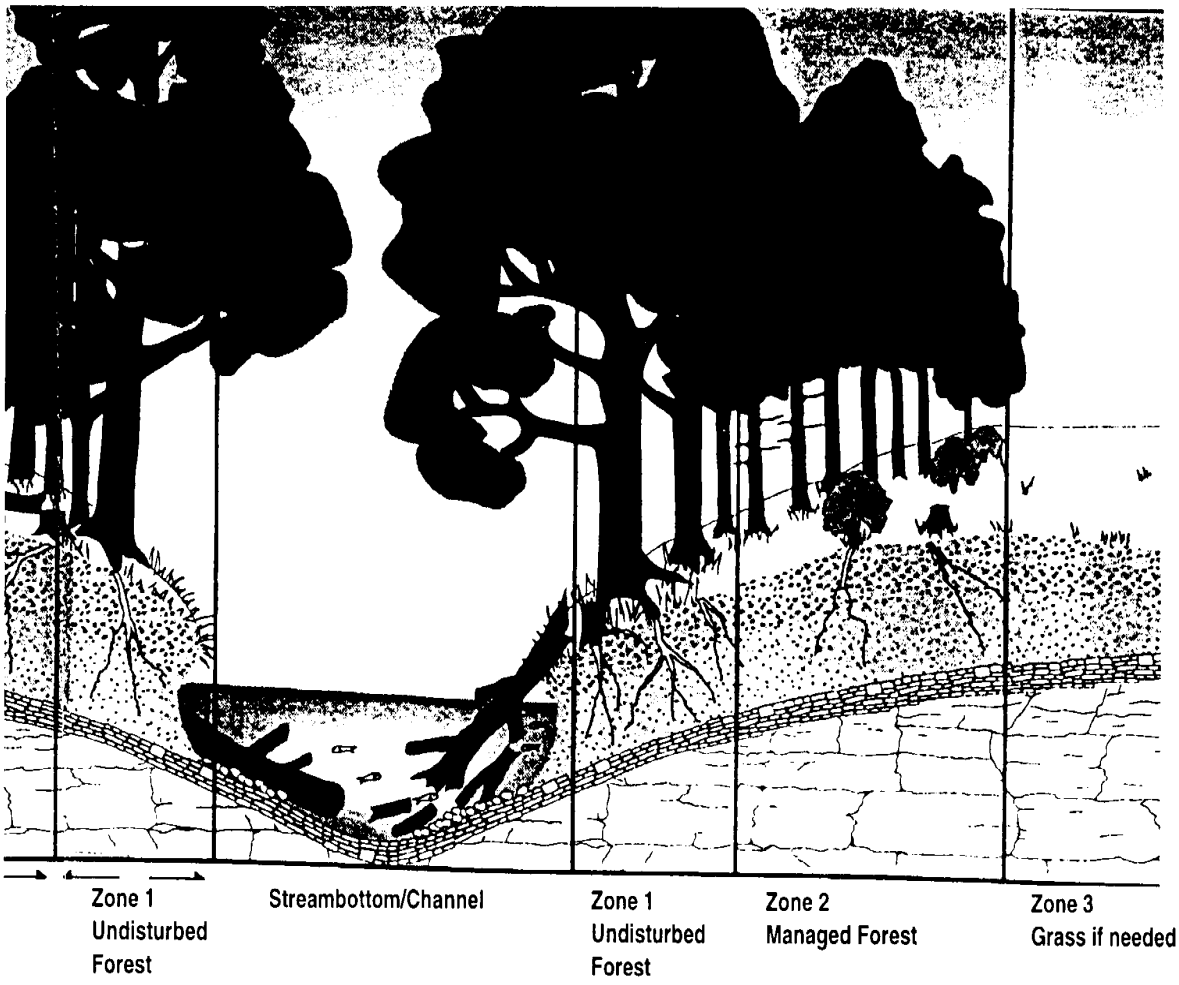

Figure 2. Location of the Zones Source: PACD; PADEP

In agricultural settings, livestock are an added hazard. Trampling and browsing are common. Fencing is the only effective protection measure. Water course crossings and livestock watering facilities shall be included if necessary.

Herbaceous Cover Establishment: Herbaceous ground cover should be established at the time of tree and shrub planting. This cover should complement, not compete with the desired vegetation. Various grasses, forbs, and ferns are recommended. See Appendix for recommended species.

SPECIFICATIONS :

Planting Techniques

Bare Root Seedlings

Availability: Bare root seedlings are readily available from private and public sources. These plants can be transported and shipped at minimal cost.

Unit cost and associated risk: The unit prices are the least of the four planting types. However, the cost of maintenance and replanting of bare root trees and shrubs is the highest. The risk associated with bare root material is high.

Schedule window for planting bare root stock is limited and must coincide with shipping dates of suppliers. Typical planting windows occur in the spring of each year or late fall after dormancy. Mortality of bare root material is much higher than other planting types. Mortality typically is attributable to improper storage and handling, desiccation, improper planting techniques, competition for sunlight and water from adjacent weeds with mature root structures, and rodent and animal damage. Survival rates can be increased with guidance and professional management throughout the planting process.

Equipment required: Bare root seedlings can be planted with manual labor. Equipment needs consist of shovels, dibble bars, or planting bars.

Planting procedure: Extreme care should be taken while handling bare root plants to avoid desiccation. The roots of the plants should be transported in a wet cloth or bucket of water during installation. During planting, the soil adjacent to the roots needs to be compressed, tamped, and packed to eliminate air pockets. Air pockets in the rooting area will cause desiccation and mortality. Plants should be watered immediately after being planted.

Recommended planting density: The recommended planting density of bare root material is 700 units/acre.

Container-Grown Seedlings

Availability: Container-grown seedlings are available from a limited number of native-plant nurseries.

Unit cost and associated risk: The unit costs are low. The cost of shipping is moderate and is determined by the plant quantity and distance. The risk associated with container-grown material is less than bare root material. The roots are well-developed and can withstand periods of drought in comparison with bare root material. In addition, the seedling can be planted throughout the year.

Equipment required: Container-grown material can be planted manually as identified above or mechanically with a hand-held portable auger.

Planting procedure: Before planting, observe the condition of the roots. Roots should be white. If roots are completely brown, the plant is not healthy and should be replaced. Plants should be watered immediately after being planted.

Recommended planting density: The recommended planting density for container-grown material is 350 units/acre.

Container-Grown Plants

Availability: Container-grown plant material is available, ranging in size from 1 gallon to 7 gallon containers, in heights of 12-18 inches to 5-7 feet. The number of suppliers of container-grown native plants is limited.

Unit cost and associated risk: The unit costs are moderate. The cost of shipping is moderate and is determined by the plant quantity and distance. The risk associated with container-grown material is significantly less because the roots are well-developed and can withstand periods of drought. The height of the plants typically is above the level of the weeds competing for sunlight. In addition, the plants can be planted throughout the year.

Equipment required: Containerized material can be planted manually. Mechanical planting by auger with tractor or bobcat is not recommended for sensitive riparian areas.

Planting procedure: Score edges of the planting hole to enable the roots to penetrate properly beyond the planting hole. Before planting, observe the condition of the roots. Roots should be white. If the entire root system is brown, the plant is not healthy and should be replaced. If roots are circling around the ball, score or “butterfly” the roots with a knife or loosen by hand before planting. Plants should be watered immediately after being planted.

Recommended planting density: Recommended planting density for container-grown material is 250 to 300 units/acre.

Balled and Burlapped Plants

Availability: Balled and burlapped trees typically are grown and harvested in sizes from 1-inch to 2.5-inch caliper. Suppliers of B&B native plants are limited. The cost of B&B plants

and shipping is the highest of the four planting types. B&B plants typically are not cost-effective for riparian forested buffer projects.

Unit cost and associated risk: The risks associated with B&B material typically are the least of the four planting types. Plants can be planted throughout the year. The roots of B&B plants are highly developed. The size of the plants enable them to out compete weeds for sunlight and water. However, establishing B&B plants can be a problem with transplanting. In some instances, additional root growth does not occur outside of the planting hole. This is a result of long-term root adaptation to the original soil conditions where the plant was grown.

If they do not grow beyond the planting hole, the plant is subject to mortality several years after planting. Plants should be watered immediately after being planted. B&B plants typically are planted where aesthetic concerns are a priority.

Equipment required: B&B material typically is planted with a tree spade or specialized equipment.

Planting procedures: Trees should not be picked up by the trunk or dropped, as both practices will separate the trunk from the root ball. Before planting, the root ball and planting hole should be kept moist. The tree will need to be staked in most cases for initial support and stabilization.

Recommended planting density: Recommended planting density for B&B materials is 100 to 150 units/acre.

Considerations

Because riparian forest buffers are maintained differently than more familiar park turf, natural riparian areas may sometimes be seen as dangerous or unattractive or unmanaged public grounds. Concerns often arise over loss of the 'viewshed' to the water. In worst cases, the public may see grown-up riparian areas as places to litter. Therefore, an education program including signage is critical. In addition, in critical areas where a water view is especially important to a homeowner or the general public, the vegetation selected should consist more of stiff stemmed grasses and low growth shrubs.

Public access to the water's edge is usually important. Trails should consist of wood chips and be set back at least 15 feet from the edge of the bank, near the interface of zones 1 and 2. Occasional openings to the water's edge should be stabilized with rock and located where runoff will be diverted to the side, into the buffer.

Whenever possible, buffers should be established on both sides of a water course to enhance multiple values. Joining of existing buffers with new sections increase the continuity of cover and will add to all positive benefits.

Favor tree and shrub species that are native to the region and have multiple values such as those suited for timber, nuts, fruit, nesting, aesthetics, and tolerance to site soil, moisture, and runoff pollutant conditions. Avoid tree and shrub species that may be alternate hosts to undesirable pests or that are considered noxious or undesirable by the landowner. Species diversity should be considered to avoid loss of function due to species-specific pests.

Species selection criteria to improve aesthetics include seasonal foliage color, showy flowers, fruit, shade density, form, and branching. The layout and design should look natural and blend with the terrain. A landscape analysis can help determine specific requirements for species selection.

Operations and Maintenance

Important: *In urban and suburban areas, grounds maintenance personnel will require additional education to ensure that corridors are not reduced by aggressive or careless mowing, pruning, and herbicide use.*

Watering will most likely be necessary in the first year to establish trees and shrubs, and later if any replanting is done. Provisions shall be made to get water to the plants from the water body.

The riparian forest buffer will be inspected annually, repaired and replanted as needed, to meet the goals of plant density and diversity as well as runoff sheet flow. Control of concentrated flow erosion shall be continued in the up gradient area immediately adjacent to zone 2.

The buffer must maintain a minimum of 50 percent tree and shrub canopy cover. The dominant canopy should be managed to maintain maximum vigor of understory vegetation.

Any use of fertilizers, mechanical treatments, pesticides and other means to assure optimum buffer function shall not compromise the intended purpose. Biological control of undesirable plant species and pests shall be implemented where available and feasible.

Buffer damage from deer and rodents shall be monitored and controlled as mentioned previously.

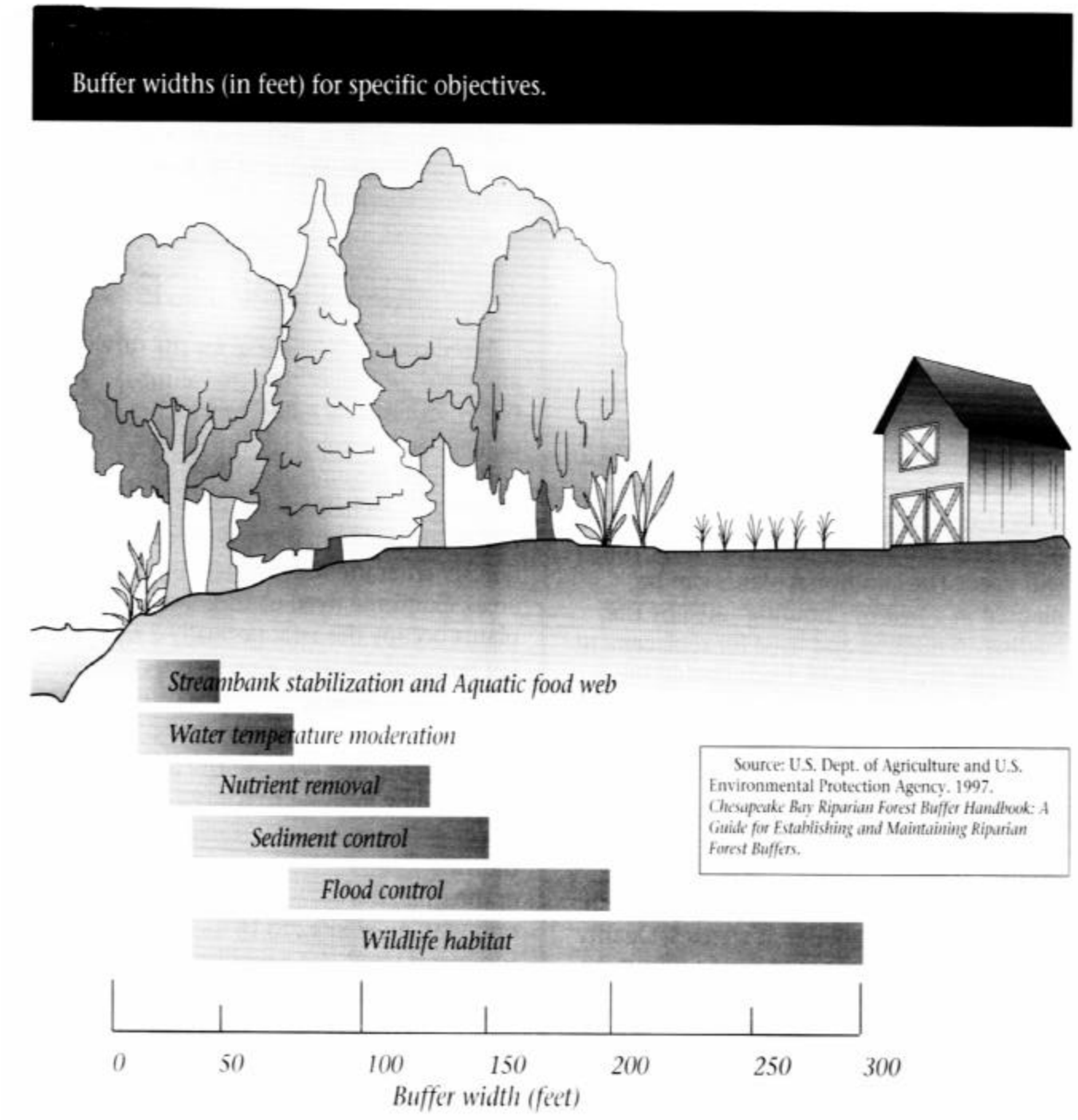

Figure 3. General Buffer Width Guidance Source: Maryland Cooperative Extension